

Making Improved Reliability a Reality

Ernest Seglie, Ph.D.

Science Advisor,
Operational Test and Evaluation,
Office of the Secretary of Defense, Washington, DC

The September 2008 issue of Information Systems Test & Evaluation focused on improving suitability. It coincided with, and in some cases led, reliability improvement policy and guidance. By early September 2008, all the military departments responded positively to the direction of Under Secretary Young in July 2008 to “establish a reliability improvement acquisition policy to address the problem of inadequate system RAM [reliability-availability-maintainability].” For example, on September 4, 2008, Dr. Donald Winter, Secretary of the Navy, stated, “Having performance is important, but not as important in most cases, as having reliability.” I offer several specific examples of progress made toward improving suitability and reliability and a guide on where to find the products.

On June 6, 2008, the Defense Science Board Task Force on Developmental Test and Evaluation (which focused on improving reliability) released its final report. It is available at <http://www.acq.osd.mil/sse/dte/docs/DSB-Rpt-DTE-May2008.pdf>. Charged to implement key Defense Science Board recommendations, the U.S. Department of Defense (DoD) Reliability Improvement Work Group (RIWG) worked from March to August 2008 to:

- ensure programs are formulated to execute a viable systems engineering strategy from the beginning, including a reliability-availability-maintainability (RAM) growth program, as an integral part of design and development (that is, *Start Programs Right*);
- ensure government organizations reconstitute a cadre of experienced Test and Evaluation (T&E) and RAM personnel (*Re-enforce the Work Force*);
- implement mandated integrated developmental test and operational test, including the sharing and access to all appropriate contractor and government data and the use of operationally representative environments in early testing (*Implement Integrated Testing*).

On September 4 the RIWG published its final report containing implementing actions and products,

along with military departments’ implementing steps for those actions and products. The report is available at <http://www.acq.osd.mil/sse/dte/spec-studies.html>.

RIWG products were developed by representatives from all military departments and the Defense Information Systems Agency (DISA). It is widely agreed that these products are comprehensive and, if implemented, will be effective in achieving proper defense system reliability and thereby containing system sustainment costs. A short summary of RIWG products includes the following.



Ernest Seglie

Start programs right Department policy for reliability improvement

Issued on July 21, 2008, it states:

“It is Department policy for programs to be formulated to execute a viable RAM strategy that includes a reliability growth program as an integral part of design and development. Additionally, RAM shall be integrated within the systems engineering processes, documented in the program’s Systems Engineering Plan and Life Cycle Sustainment Plan, and assessed during technical reviews, test and evaluation, and program support reviews. This policy will be included in the DoD Instruction 5000.2.”

The secretaries of the military departments were directed to establish their own reliability improvement

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE DEC 2008		2. REPORT TYPE		3. DATES COVERED 00-00-2008 to 00-00-2008	
4. TITLE AND SUBTITLE Making Improved Reliability a Reality				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Office of the Secretary of Defense, Operational Test and Evaluation, Washington, DC, 20301				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 3	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

acquisition policy. The policy memo is at <http://www.acq.osd.mil/sse/dte/docs/USD-ATLMemo-RAM-Policy-21Jul08.pdf>.

Sample reliability language for Sections C, L, and M of acquisition contracts

It also includes a checklist for evaluating reliability program plans and a sample performance incentive fee. For example, from the sample language for Section C (Statement of Work):

"The contractor shall develop a reliability model for the system. At a minimum, the system reliability model shall be used to: (1) generate and update the reliability allocations from the system level down to lower indenture levels; (2) aggregate system-level reliability based on reliability estimates from lower indenture levels; (3) identify single points of failure; and (4) identify reliability-critical items and areas where additional design or testing activities are required in order to achieve the reliability requirements."

The contract language is at <https://acc.dau.mil/CommunityBrowser.aspx?id=219127&lang=en-US>.

The language and practices are consistent with a new industry standard for reliability: GEIA-STD-0009: Reliability Program Standard for Systems Design, Development, and Manufacturing, August 2008.

Program reliability and maintainability review template

This tool defines relevant reliability activities and evidence of them associated with 16 technical reviews across system acquisition. For example, in the initial technical review during concept refinement, look for evidence of documented reliability assumptions and supporting rationale accompanying reliability requirements for the preferred solution. The template is available at <http://www.acq.osd.mil/sse/docs/RAM-Planning-Template.xls>.

Standard evaluation criteria

To determine if system contractors employ practices needed to achieve reliability requirements, a scorecard offers criteria and a scoring means. For example, one criterion is "sufficiently-sized reliability engineering staff directly tied to design team." The contractor score is determined by the size of the reliability engineering staff, its workload, and its communication with the system design team. The scorecard is at <https://acc.dau.mil/CommunityBrowser.aspx?id=210483&lang=en-US>.

RAM champions in each Service

The RIWG recommended designated Service "champions" to ensure reliability initiatives become

institutionalized. For example, the U.S. Army has named a headquarters executive to serve as the Department of the Army Reliability Chief.

Re-enforce the work force Strengthen Defense Acquisition University curriculum

RIWG representatives recommended Defense Acquisition University curricula and work force certification changes to the Overarching-Functional Integrated Product Team. There was broad concurrence that the Defense Acquisition University can further the intent for RAM effectiveness by coordinating the education of the functional work forces that play pivotal roles at various life cycle stages of systems development. Most recently, the RIWG proposed reliability contracting subject matter for contracting work force education.

Implement integrated testing Integrated testing defined

A memorandum formally defines integrated T&E as a basis for developing further guidance. The memorandum is at <http://www.acq.osd.mil/sse/dte/docs/SecDefMemo-Definition-of-Integrated-Testing-25Apr08.pdf>

Early T&E involvement in RFPs [Request for Proposals] and contracts. The RIWG included data sharing concepts in a guidebook titled "Incorporating Test and Evaluation into Department of Defense Acquisition Contracts." The guidebook is located at <http://www.acq.osd.mil/sse/dte/guidance.html>.

New Defense Acquisition Guidebook Guidance and T&E Master Plan format. New guidance in the Defense Acquisition Guidebook Guidance and a new T&E Master Plan format emphasize integrated T&E. It is available at https://akss.dau.mil/DAG/Guidebook/IG_c9.0.asp.

Service implementation responses

Across the DoD, implementation of the actions in the RIWG report is in progress. The Army has been aggressive in emphasizing reliability accountability, contracting for reliability, and establishing an early warning mechanism for potential reliability problems. The U.S. Navy is reinvigorating their RAM processes and implementing reforms such as use of the new GEIA standard in developing program requirements (that standard, GEIA-STD-0009 Reliability Program Standard for System Design, Development and Manufacturing, is available through the ITAA Government Electronics and Information Technology Association On-Line Web Store at http://www.techstreet.com/cgi-bin/detail?product_id=1568406).

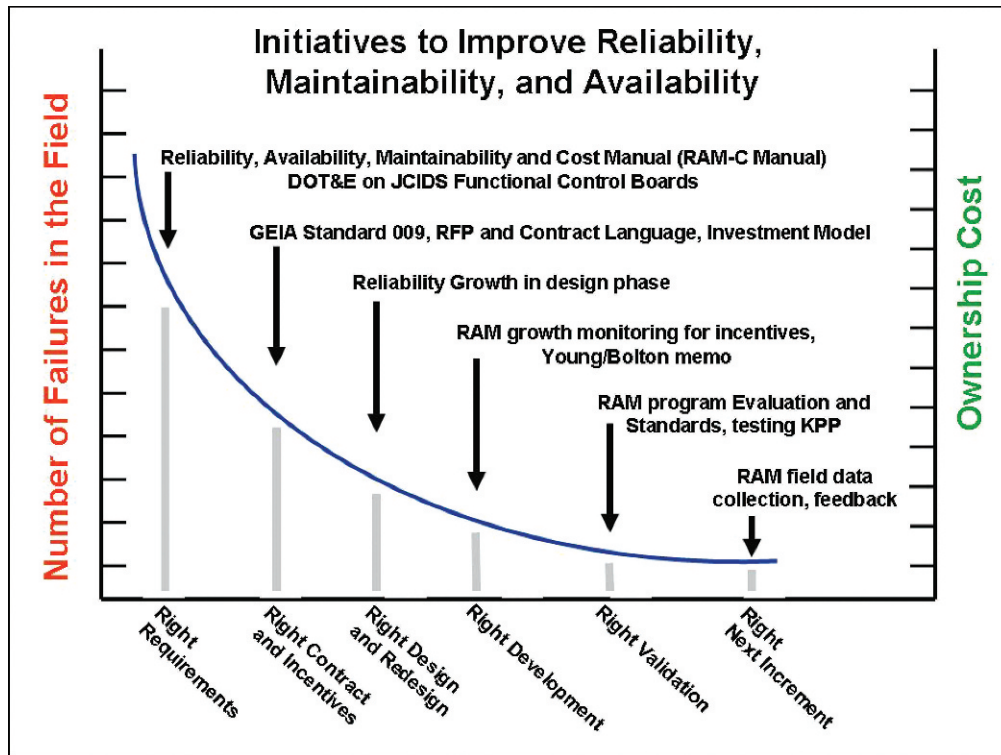


Figure 1. Result of reliability improvement—fewer failures, reduced ownership cost

The U.S. Air Force is examining their policies and processes to improve RAM.

Department leadership reviewed RIWG actions and products and Services implementation in late September and directed a follow-up review in December 2008 to assess the extent of implementation.

With this emphasis across the department, it is reasonable to expect to see improved reliability in programs. We will not see results overnight, as it must begin with requirements and contracts or those opportunities that occur in any program restructuring. The end result of these initiatives will be reduced system ownership costs, fewer failure modes, improved reliability, and improved system value to our warfighters, as *Figure 1* illustrates.

Of course, testers have a vital role. RAM expertise is in short supply across the DoD (and industry). T&E

can step forward, join requirements efforts, influence program office System Engineering Plans and T&E Master Plans to properly plan effective reliability programs, and measure and report results. Only with T&E data will programs know where they stand with respect to failure modes, demonstrated system reliability, and the reliability growth potential. □

DR. ERNEST SEGLIE is science advisor, Office of the Director, Operational Test and Evaluation (DOT&E), the Pentagon, Washington, D.C. He provides scientific and technical guidance on the overall approach to Department of Defense (DoD) evaluation of the operational effectiveness and suitability of major DoD weapon systems, provides technical review of test reports, and serves as chief technical advisor to the Director, DOT&E.